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(54) MODULARIZED HEARING AID CIRCUIT STRUCTURE

MODULARE SCHALTUNGSSTRUKTUR FÜR HÖRHILFEGERÄT

STRUCTURE DE CIRCUIT POUR PROTHESE AUDITIVE MODULAIRE

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(56) References cited:
EP-A- 0 453 200
EP-A- 0 500 988
DE-A- 3 623 906
DE-C- 4 444 586

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Description

Cross-Reference to Related Application

[0001] This application is a continuation-in-part of commonly-owned application number 08/640,372 filed April 30, 1996. The entire disclosure of this copending patent application, including the drawings, is hereby incorporated herein as if fully set forth.

Background of the Invention

[0002] The invention relates to hearing aids, and more particularly relates to circuits used in hearing aids. In its most immediate sense, the invention relates to modular in-ear hearing aid circuit structures from which a plurality of hearing aid models, particularly programmable models, may be assembled.

[0003] Hearing aid manufacturers offer an entire line of hearing aids. Each model incorporates a particular type of hearing aid circuit. When a dispenser fits a patient with a hearing impairment, the dispenser selects the particular hearing aid model having the circuit that best addresses the patient's needs.

[0004] Conventionally, hearing aid circuits are built up by hard-wiring discrete components together. As a result, hearing aid manufacturers are required to maintain a relatively large inventory of electronic components and subassemblies and to train manufacturing personnel to assemble those parts in many different configurations. These steps are costly.

[0005] Additionally, in-ear aids (ITE "in the ear" aids; CIC "completely in canal" aids; and canal aids) are custom-manufactured for the patient and therefore can vary widely in their physical configurations. This variation requires that the manufacture of the hearing aid circuit be highly customized to the intended application and such customization adds to manufacturing cost.

[0006] It would therefore be advantageous to provide a modularized hearing aid circuit that would reduce the number of different electronic subassemblies that must be maintained in inventory.

[0007] It would also be advantageous to provide a modularized hearing aid circuit that could, using a limited number of modules and physical configurations, be configured to constitute any one of the circuits in the manufacturer's line of hearing aids.

[0008] In accordance with one aspect of the invention, first and second battery terminals and first and second circuit boards are provided. Each of the terminals is supported by a corresponding one of the circuit boards. The circuit boards form a support having a plurality of support stations, for supporting a like plurality of additional circuit boards of rectangular shape and common width. The terminals are so located that a hearing aid battery inserted into the hearing aid contacts both of the battery terminals.

[0009] In accordance with this aspect of the invention, hearing aid circuits and circuit options (e.g. an amplifier circuit, a programmable control circuit, filter circuits, switching circuits etc.) are mounted on additional circuit boards, which are in turn mounted upon the support. This makes it easy to produce a hearing aid of the desired model merely by selecting the necessary components and mounting them (in the preferred embodiment, as many as four of them) upon the support.

[0010] In accordance with another aspect of the invention, which is particularly advantageous for use with programmable hearing aids, a multi-electrode strip is also provided. The additional circuit board (or boards) is (or are) electrically connected to this strip. In the preferred embodiment of this aspect of the invention, the distal end of this strip is terminated with programming terminals. This makes it possible to program the programmable control circuit using an external programmer.

[0011] In the preferred embodiment, at least one, and perhaps both, of the first and second circuit boards are provided with a capacitor. This permits a very large capacitance to be placed across the hearing aid battery. This is advantageous because when the battery is substantially discharged, the impedence of the battery can greatly increase the current drawn by the circuit during operation.

Brief Description of the Drawings

[0012] The invention will be better understood with reference to the following exemplary and non-limiting drawings, in which:

Fig. 1 illustrates the wiring in a typical programmable hearing aid of the type sold by assignee Siemens Hearing Instruments, Inc. under the IntelliVenience trademark;

Fig. 2 illustrates the wiring in an IntelliVenience-type hearing aid in accordance with the preferred embodiment of the invention;

Fig. 3 illustrates how the battery terminals and supporting circuit boards may be mounted to the faceplate of an in-ear hearing aid;

Figs. 4A and 4B illustrate an alternate structure to the structure illustrated in Fig. 3;

Figs. 5 and 6 schematically illustrate how additional circuit boards may be electrically connected together; and

Figs. 7A, 7B and 8 schematically illustrate how a programmable hearing aid in accordance with a preferred embodiment of the invention can be programmed using an external programmer.

Detailed Description of Preferred Embodiments

[0013] In the following description, the same element is always indicated by the same reference number in all the Figures. The drawings are not to scale, and are oc-

casionally exaggerated for clarity.

[0014] In a conventional programmable hearing aid of the type sold by assignee Siemens Hearing Instruments, Inc. under the IntelliVenience trademark, a hybrid circuit 2 is connected to two battery terminals 4 and 6 and to a four-line connector 8. The connector 8, which is mounted in the faceplate (not shown) of the aid, is used to program the hybrid circuit 2. A large capacitor 10 is hardwired between the terminals 4 and 6, and two other capacitors 12 and 14 are connected to the hybrid circuit 2 and to the hearing aid receiver (not shown) respectively.

[0015] As is immediately evident from Fig. 1, the assembly of the illustrated circuit is time-consuming and difficult. Space constraints may require the illustrated components to be relocated, and the capacitors 10, 12 and 14 must be wrapped with an insulator to avoid short circuits. Furthermore, it is difficult and frequently impossible to mount the various components (particularly the capacitors 10, 12 and 14) so they remain immobile when the aid is dropped or vibrated. Therefore, the aid may not be as mechanically robust as would be desirable.

[0016] Fig. 2 shows the preferred embodiment of the invention. Generally, in accordance with the preferred embodiment, a hollow support structure is mounted on the faceplate of the aid and the interior of the support structure is accessible through the battery door. When the battery is inserted into the aid through the battery door, the battery is located within the support structure. Furthermore, the support structure has a plurality of support stations where circuit boards may be attached. As will become evident below, the preferred embodiment not only makes it possible to easily assemble a variety of models using the same platform , but is also versitile and mechanically robust.

[0017] Fig. 3 shows a faceplate 20 of a preferred embodiment in accordance with the invention. The faceplate 20 has an opening 22, which is dimensioned to receive a hearing aid battery (not shown) and which in use may be closed off by a battery door. (The battery door is not shown in Fig. 3.) The opening 22 is rectangular and has two elongated sides S and two ends E. Two slots 24 and 26 are located in the faceplate 20 adjacent the sides S.

[0018] The slots 24 and 26 are shaped to receive corresponding assemblies 28 and 30, respectively. Each of the assemblies 28 and 30 has a circuit board (28B and 30B respectively) and a battery terminal 28T and 30T respectively. In each of the assemblies 28 and 30, the battery terminal (28T, 30T) is electrically and mechanically connected to the circuit board 28B, 30B) and each assembly 28, 30 is inserted into the corresponding slot 24, 26 and held therein by adhesive. The spacing of the assemblies 28, 30 and the dimensioning of the terminals 28T, 30T is such that when a hearing aid battery (not shown) is inserted into the aid through the opening 22, it makes electrical contact with the terminals 28T, 30T and is held between them.

[0019] An alternate to the Fig. 3 structure is shown in Figs. 4A and 4B. Here, the assemblies 28' and 30' use the same terminals 28T, 30T but the circuit boards 28B' and 30B' have slightly different shapes than the circuit boards 28B and 30B and the assemblies 28' and 30' are not held within slots in the faceplate (not shown).

[0020] The assemblies shown in Figs. 3, 4A and 4B form a support structure having a plurality of support stations at which circuit boards may be attached. In these examples, there are four support stations formed by surfaces SS1, SS2, SS3, and SS4 respectively (see Fig. 3), but the number of support stations is not a part of the invention. There may be more or fewer.

[0021] Each support station allows a rectangular circuit board (not shown in Fig. 3) of a predetermined width to rest upon, and to be mechanically supported by, the support structure. In this example, larger boards can be supported on the top of the support structure, but this is not required.

[0022] In this preferred embodiment, the support structure provides mechanical support for the additional circuit boards, the electrical connections with the boards being provided through a multi-electrode strip described below. However, this is not required, and such electrical connections may alternatively be established using mating electrical pads on the circuit boards.

[0023] In conventional programmable hearing aids, a large capacitor is placed across the battery so that the internal impedence of the battery does not affect the performance of the aid when the battery has been substantially discharged. If desired, such a capacitor can be provided in the preferred embodiment by forming a capacitor on one or both of the circuit boards in the support structure. This can be accomplished by using a multilayer circuit board and using adjacent spaced-apart layers as plates of a capacitor. This technique is known by itself.

[0024] Fig. 5 illustrates how a multi-electrode strip 32 can be used to make the necessary electrical interconnections between additional circuit boards 34, 36, 38 and 40. The multi-electrode strip 32 has a plurality of electrical pads P; in this example, there are four groups of 8 pads so that it is possible to make as many as 8 electrical connections with each of the circuit boards 34, 36, 38 and 40. This is exemplary; the number of pads P and the arrangement of the pads P on the strip 32 is not a part of the invention.

[0025] Ordinarily, one of the circuit boards 34, 36, 38, 40 will contain an amplifier circuit, and another one will contain a programmable control circuit. Other circuit options, such as filters, switching circuits etc. can be contained in other circuit boards and connected as required for the particular model being assembled. Thus, it is easy to assemble a large number of different models of hearing aids merely by selecting the proper circuit boards, connecting them to the multi-electrode strip 32, and mounting them to the support structure. Individualized wiring is unnecessary.

[0026] The multi-electrode strip 32 has a distal end 42 on which three programming electrodes 44 are located. (The number of electrodes 44 is not a part of the invention.) Advantageously, the distal end 42 is folded over to form an integral spring, adjacent one of the ends E of the opening 22. In this manner, the programmable control circuit can be programmed using the cable 44 from a external programmer (not shown).

[0027] In the preferred embodiment, a "beside the door" programming system is used to program the programmable control circuit. The preferred system is disclosed in commonly-owned pending U.S. patent application number 08/640,372 filed April 30, 1996. However, this is not required and it would alternatively be possible to e.g. make connections through a connecter mounted on the faceplate, as in the known IntelliVenience aid.

[0028] Although reference has been made to "circuit boards", this is not limited to e.g. printed circuit boards. The circuit boards 34, 26, 38 and 40 can also be, and indeed usually will be, ceramic structures in which electronic circuit(s) are embedded.

[0029] Although a preferred embodiment of the invention has been described above, the scope of the invention is limited only by the following claims:

Claims

1. A modularized hearing aid circuit, comprising:

   first and second battery terminals (28T,30T);
   first and second circuit boards (28B,30B), each being mechanically and electrically connected to a corresponding one of the battery terminals in a manner that a hearing aid battery inserted into the hearing aid will contact both battery terminals; and
   a third circuit board (34; 36; 38; 40), the third circuit board including an amplifier circuit which is electrically connected to the battery terminals and which is mechanically supported between the first and second circuit boards.

2. The circuit of claim 1, wherein the electrical connection between the third circuit board and the battery terminals passes through the first and second circuit boards.

3. The circuit of claim 1 or 2, further comprising:

   a fourth circuit board (34; 36; 38; 40), the fourth circuit board being mechanically supported between the first and second circuit boards and containing a programmable control circuit; and
   a plurality of programming terminals (44), the programming terminals being electrically connected with the programmable control circuit.

4. A modularized hearing aid circuit as claimed in one of claims 1-3, further comprising:

   a multi-electrode strip (32), for electrically connecting the third circuit board to the battery terminals.

5. The circuit of claim 4, further including a programmable control circuit that is operatively connected to the third circuit board, and a plurality of programming terminals mounted to the strip, the programming terminals being electrically connectable to an external programmer and electrically connected to the programmable control circuit.

6. The circuit of claim 5, wherein the programming terminals are located at a distal end (42) of the strip (32) and the distal end of the strip is folded over to form an integral spring.

7. The circuit of claim 5 or 6, wherein the programmable control circuit is located on a fourth circuit board that is electrically connected to the strip (32) and is mechanically supported between the first and second circuit boards.

8. The circuit of any preceding claim, further comprising a capacitor formed on at least one of the first and second circuit boards.

9. A modular hearing aid circuit structure for use in programmable hearing aids, comprising:

   a modularized hearing aid circuit as claimed in any preceding claim; and
   a hearing aid faceplate (20) having an interior surface, an exterior surface and an elongated opening (22) for receiving a hearing aid battery, the opening having two elongated sides (S) and two ends (E);
   wherein the opening of the hearing aid faceplate and the first and second circuit boards and the first and second battery terminals of the modularized hearing aid are so located and dimensioned that a battery introduced through the opening will be held between the terminals and will be in electrical contact therewith.

10. The structure of claim 9, wherein first and second circuit boards have a common shape and together define a circuit board support having a plurality of support stations (SS1, SS2, SS3, SS4) for supporting a like plurality of additional circuit boards (34, 36, 38, 40) of rectangular shape and common width, the first and second circuit boards being mounted to the faceplate adjacent the sides of the opening.

11. The structure of claim 9 or 10, further comprising:

at least two additional circuit boards, one of the additional circuit boards containing an amplifier circuit and another one of the additional circuit boards containing a programmable control circuit, the programmable control circuit being operatively connected to the amplifier circuit;
a multi-electrode strip (32),the strip being electrically connected to at least the another one of the two additional circuit boards and to the battery terminals;
a plurality of programming terminals (P) mounted to the strip, the programming terminals being electrically connectable to an external programmer and electrically connected to the programmable control circuit, the programming terminals being adjacent the opening.

12. The structure of claim 11, wherein the distal end of the strip is located adjacent an end of the opening.

13. A hearing aid, including a modularized hearing aid circuit as claimed in one of claims 1-8 or a modularized hearing aid circuit structure as claimed in one of claims 9-11.

Patentansprüche

1. Modulare Hörhilfenschaltung, umfassend:

einen ersten und einen zweiten Batterieanschluss (28T, 30T) ;
eine erste und eine zweite Platine (28B, 30B), die jeweils mechanisch und elektrisch mit einem entsprechenden Batterieanschluss verbunden sind, und zwar derart, dass eine in die Hörhilfe eingesetzte Hörhilfenbatterie beide Batterieanschlüsse berührt; und
eine dritte Platine (34; 36; 38; 40), wobei die dritte Platine eine Verstärkerschaltung enthält, die elektrisch mit den Batterieanschlüssen verbunden ist und mechanisch zwischen der ersten und der zweiten Platine gehalten wird.

2. Schaltung nach Anspruch 1, wobei die elektrische Verbindung zwischen der dritten Platine und den Batterieanschlüssen über die erste und zweite Platine verläuft.

3. Schaltung nach Anspruch 1 oder 2, zudem umfassend:

eine vierte Platine (34; 36; 38; 40), wobei die vierte Platine mechanisch zwischen der ersten und der zweiten Platine gehalten wird und eine programmierbare Steuerschaltung enthält; und
eine Anzahl Programmieranschlüsse (44), wobei die Programmieranschlüsse elektrisch mit der programmierbaren Steuerschaltung verbunden sind.

4. Modulare Hörhilfenschaltung nach irgendeinem der Ansprüche 1 bis 3, zudem umfassend:

einen Mehrfachelektrodenstreifen (32), der die dritte Platine elektrisch mit den Batterieanschlüssen verbindet.

5. Schaltung nach Anspruch 4, auch umfassend eine programmierbare Steuerschaltung, die funktional mit der dritten Platine verbunden ist, und eine Anzahl am Streifen befestigte Programmieranschlüsse, wobei die Programmieranschlüsse elektrisch an ein externes Programmiergerät angeschlossen werden können und elektrisch mit der programmierbaren Steuerschaltung verbunden sind.

6. Schaltung nach Anspruch 5, wobei die Programmieranschlüsse an einem distalen Ende (42) des Streifens (32) angeordnet sind und das distale Ende des Streifens umgebogen ist, so dass es eine integrierte Feder bildet.

7. Schaltung nach Anspruch 5 oder 6, wobei die programmierbare Steuerschaltung auf einer vierten Platine angeordnet ist, die elektrisch mit dem Streifen (32) verbunden ist und mechanisch zwischen der ersten und der zweiten Platine gehalten wird.

8. Schaltung nach irgendeinem vorhergehenden Anspruch, weiterhin umfassend einen Kondensator, der mindestens entweder auf der ersten oder der zweiten Platine ausgebildet ist.

9. Anordnung einer modularen Hörhilfenschaltung zum Gebrauch bei programmierbaren Hörhilfen, umfassend:

eine modulare Hörhilfenschaltung nach irgendeinem vorhergehenden Anspruch; und
eine Hörhilfen-Grundplatte (20), die eine Innenseite, eine Außenseite und eine längliche Öffnung (22) besitzt, die die Batterie der Hörhilfe aufnimmt, wobei die Öffnung zwei längliche Seiten (S) und zwei Enden (E) aufweist, und die Öffnung der Hörhilfen-Grundplatte, die erste und die zweite Platine und der erste und der zweite Batterieanschluss der modularen Hörhilfe so angeordnet und bemessen sind, dass eine durch die Öffnung eingeführte Batterie zwischen den Anschlüssen gehalten wird und elektrisch mit ihnen verbunden ist.

10. Anordnung nach Anspruch 9, wobei die erste und die zweite Platine eine gemeinsame Form aufweisen und zusammen eine Platinenhalterung bestim-

men, die eine Anzahl Halteplätze (SS1, SS2, SS3, SS4) besitzt, die die gleiche Anzahl zusätzlicher Platinen (34, 36, 38, 40) mit rechteckiger Form und gemeinsamer Breite halten können, und die erste und die zweite Platine auf der Grundplatte nahe an den Seiten der Öffnung montiert sind.

11. Anordnung nach Anspruch 9 oder 10, zudem umfassend:

mindestens zwei zusätzliche Platinen, wobei eine der zusätzlichen Platinen eine Verstärkerschaltung trägt und die andere zusätzliche Platine eine programmierbare Steuerschaltung, und die programmierbare Steuerschaltung funktional mit der Verstärkerschaltung verbunden ist;
einen Mehrfachelektrodenstreifen (32), wobei der Streifen elektrisch mindestens entweder mit der anderen der beiden zusätzlichen Platinen oder den Batterieanschlüssen verbunden ist;
eine Anzahl auf dem Streifen befestigte Programmieranschlüsse (P), wobei die Programmieranschlüsse elektrisch an ein externes Programmiergerät angeschlossen werden können und elektrisch mit der programmierbaren Steuerschaltung verbunden sind, und sich die Programmieranschlüsse in der Nähe der Öffnung befinden.

12. Anordnung nach Anspruch 11, wobei sich das distale Ende des Streifens nahe an einem Ende der Öffnung befindet.

13. Hörhilfe, die eine modulare Hörhilfenschaltung nach irgendeinem der Ansprüche 1 bis 8 enthält oder eine modulare Hörhilfenschaltungs-Anordnung nach irgendeinem der Ansprüche 9 bis 11.

Revendications

1. Un circuit pour prothèse auditive modulaire, comprenant :

de première et seconde bornes de batterie (28T, 30T) ;
de première et seconde plaquettes de circuit (28B, 30B), chacune étant reliée de manière mécanique et électrique à une borne correspondante parmi les bornes de batterie d'une manière telle qu'une batterie pour prothèse auditive insérée dans la prothèse auditive viendra en contact avec les deux bornes de batterie ; et
une troisième plaquette de circuit (34 ; 36 ; 38 ; 40), la troisième plaquette de circuit comprenant un circuit amplificateur qui est relié de manière électrique aux bornes de batterie et qui est supporté de manière mécanique entre les première et seconde plaquettes de circuit.

2. Le circuit de la revendication 1, dans lequel, la liaison électrique entre la troisième plaquette de circuit et les bornes de batterie passe à travers les première et seconde plaquettes de circuit.

3. Le circuit de la revendication 1 ou 2, comprenant en outre :

une quatrième plaquette de circuit (34 ; 36 ; 38 ; 40), la quatrième plaquette de circuit étant supportée de manière mécanique entre les première et seconde plaquettes de circuit et contenant un circuit de commande programmable ; et
une pluralité de bornes de programmation (44), les bornes de programmation étant reliées de manière électrique au circuit de commande programmable.

4. Un circuit pour prothèse auditive modulaire tel que revendiqué dans une des revendications 1 à 3, comprenant en outre :

une bande multi-électrode (32) pour relier et de manière électrique la troisième plaquette de circuit aux bornes de batterie.

5. Le circuit de la revendication 4, comprenant en outre un circuit de commande programmable qui est relié de manière opérationnelle à la troisième plaquette de circuit, ainsi qu'une pluralité de bornes de programmation montée sur la bande, les bornes de programmation pouvant être reliées de manière électrique à un programmateur externe et étant reliées électriquement au circuit de commande programmable.

6. Le circuit de la revendication 5, dans lequel les bornes de programmation sont placées à une extrémité distale (42) de la bande (32) et l'extrémité distale de la bande est repliée pour former un ressort qui en fait partie intégrante.

7. Le circuit de la revendications 5 ou 6, dans lequel le circuit de commande programmable est placé sur une quatrième plaquette de circuit qui est reliée de manière électrique à la bande (32) et est supportée de manière mécanique entre les première et seconde plaquettes de circuit.

8. Le circuit d'une quelconque revendication précédente, comprenant en outre un condensateur formé sur au moins l'une des première et seconde pla-

quettes de circuit.

9. Une structure de circuit pour prothèse auditive modulaire utilisable dans des prothèses auditives programmables, comprenant :

un circuit pour prothèse auditive modulaire tel que revendiqué dans une quelconque des revendications précédentes ; et
un cache pour prothèse auditive (20) présentant une surface intérieure, une surface extérieure et une ouverture allongée (22) pour recevoir une batterie pour prothèse auditive, l'ouverture présentant deux côtés allongés (S) et deux extrémités (E) ;
où l'ouverture du cache pour prothèse auditive et les première et seconde plaquettes de circuit ainsi que les première et seconde bornes de batterie de la prothèse auditive modulaire sont placées et dimensionnées de telle manière qu'une batterie introduite à travers l'ouverture sera maintenue entre les bornes et sera en contact électrique avec elles.

10. La structure de la revendication 9, dans laquelle de première et seconde plaquettes de circuit présentent une forme commune et définissent ensemble un support de plaquette de circuit présentant une pluralité de postes de support (SS1, SS2, SS3, SS4) pour supporter une pluralité analogue de plaquettes de circuit supplémentaires (34, 36, 38, 40) de forme rectangulaire et de largeur commune, les première et seconde plaquettes de circuit étant montées sur le cache de manière adjacente aux côtés de l'ouverture.

11. La structure de la revendication 9 ou 10, comprenant en outre :

au moins deux plaquettes de circuit supplémentaires, l'une des plaquettes de circuit supplémentaires contenant un circuit amplificateur et une autre des plaquettes de circuit supplémentaires contenant un circuit de commande programmable, le circuit de commande programmable étant relié de manière opérationnelle au circuit amplificateur ;
une bande multi-électrode (32), la bande étant reliée de manière électrique à au moins l'autre des deux plaquettes de circuit supplémentaires et aux bornes de batterie ;
une pluralité de bornes de programmation (P) montée sur la bande, les bornes de programmation pouvant être reliées de électriquement à un programmateur externe et étant reliées manière électrique au circuit de commande programmable, les bornes de programmation étant adjacentes à l'ouverture.

12. La structure de la revendication 11, dans laquelle l'extrémité distale de la bande est placée de manière adjacente à une extrémité de l'ouverture.

13. Une prothèse auditive, comprenant un circuit pour prothèse auditive modulaire tel que revendiqué dans une des revendications 1 à 8 ou une structure de circuit pour prothèse auditive modulaire telle que revendiquée dans une des revendications 9 à 11.

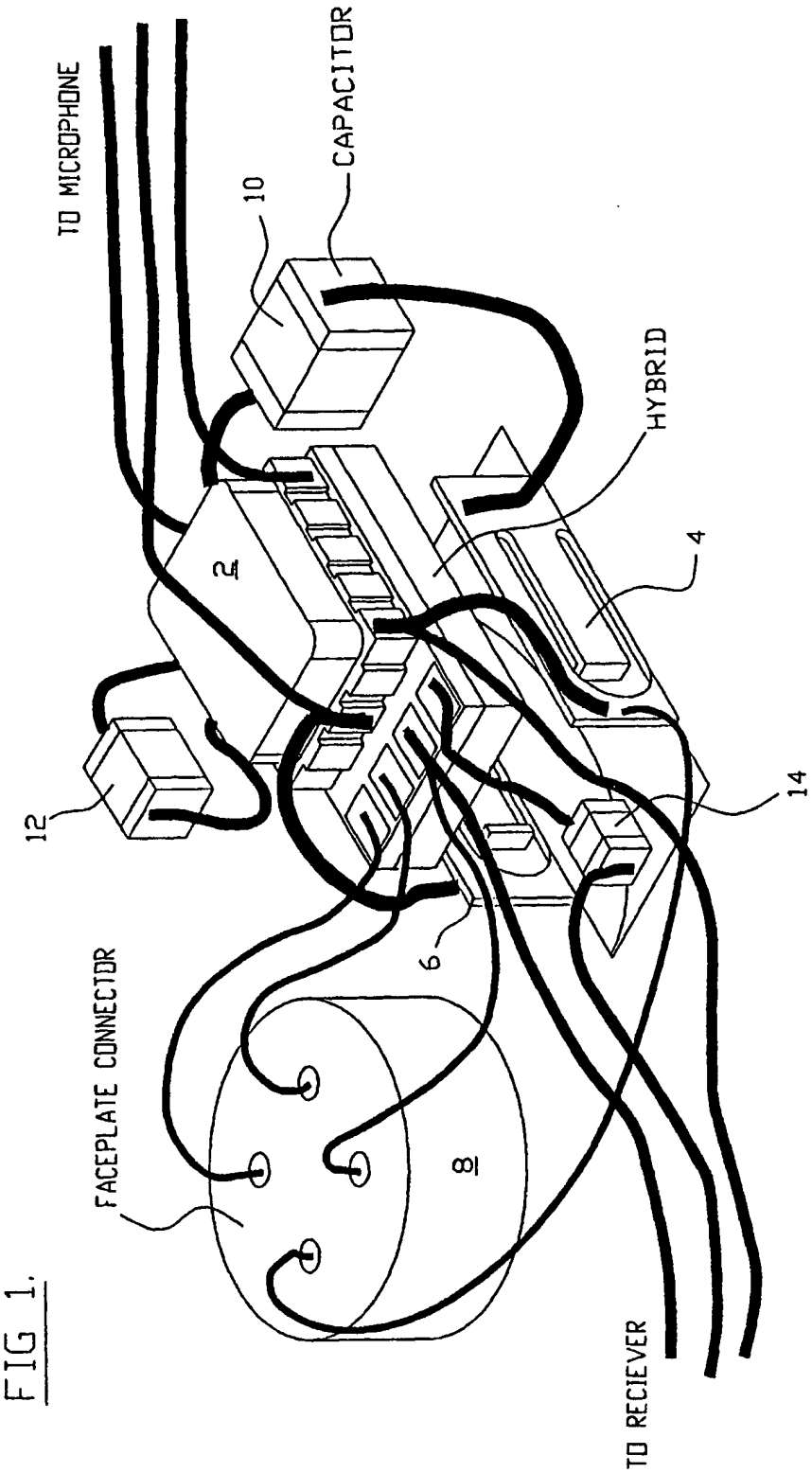

TO MICROPHONE
CAPACITOR
10
HYBRID
4
2
12
14
6
FACEPLATE CONNECTOR
8
TO RECIEVER

FIG 1.

FIG 2.

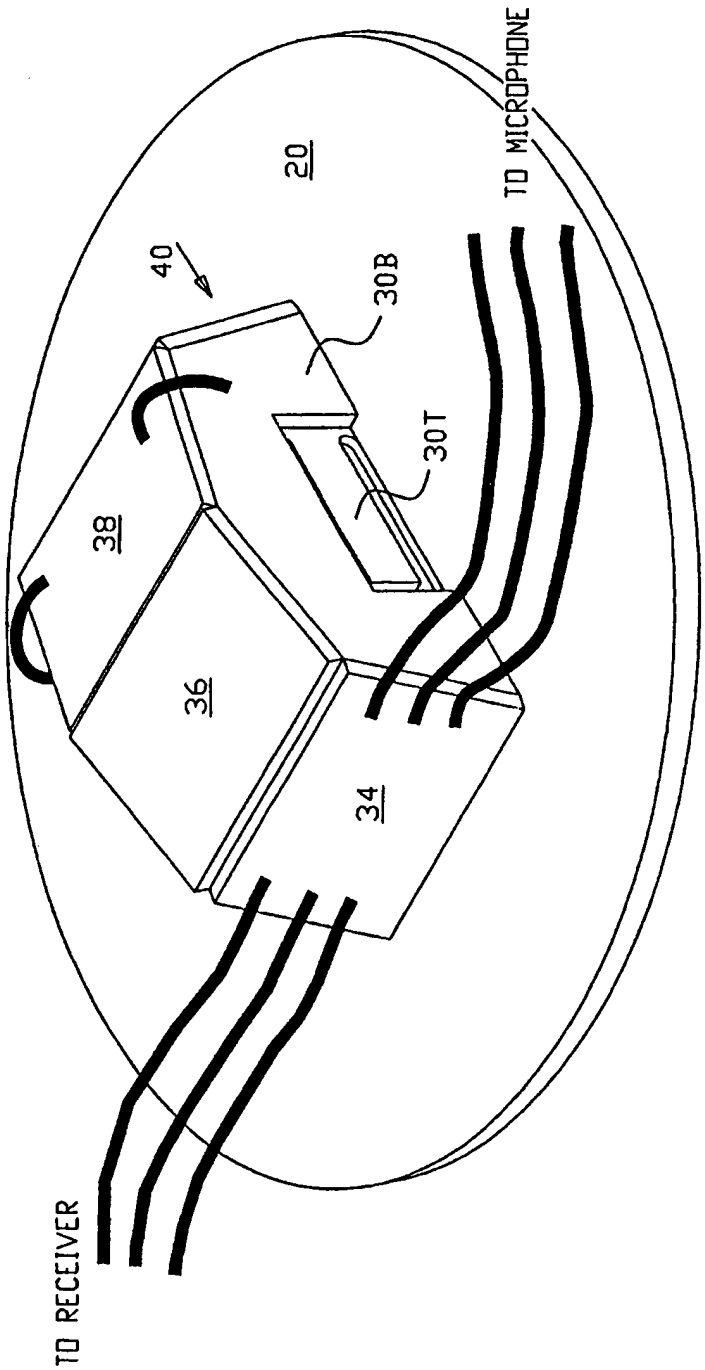
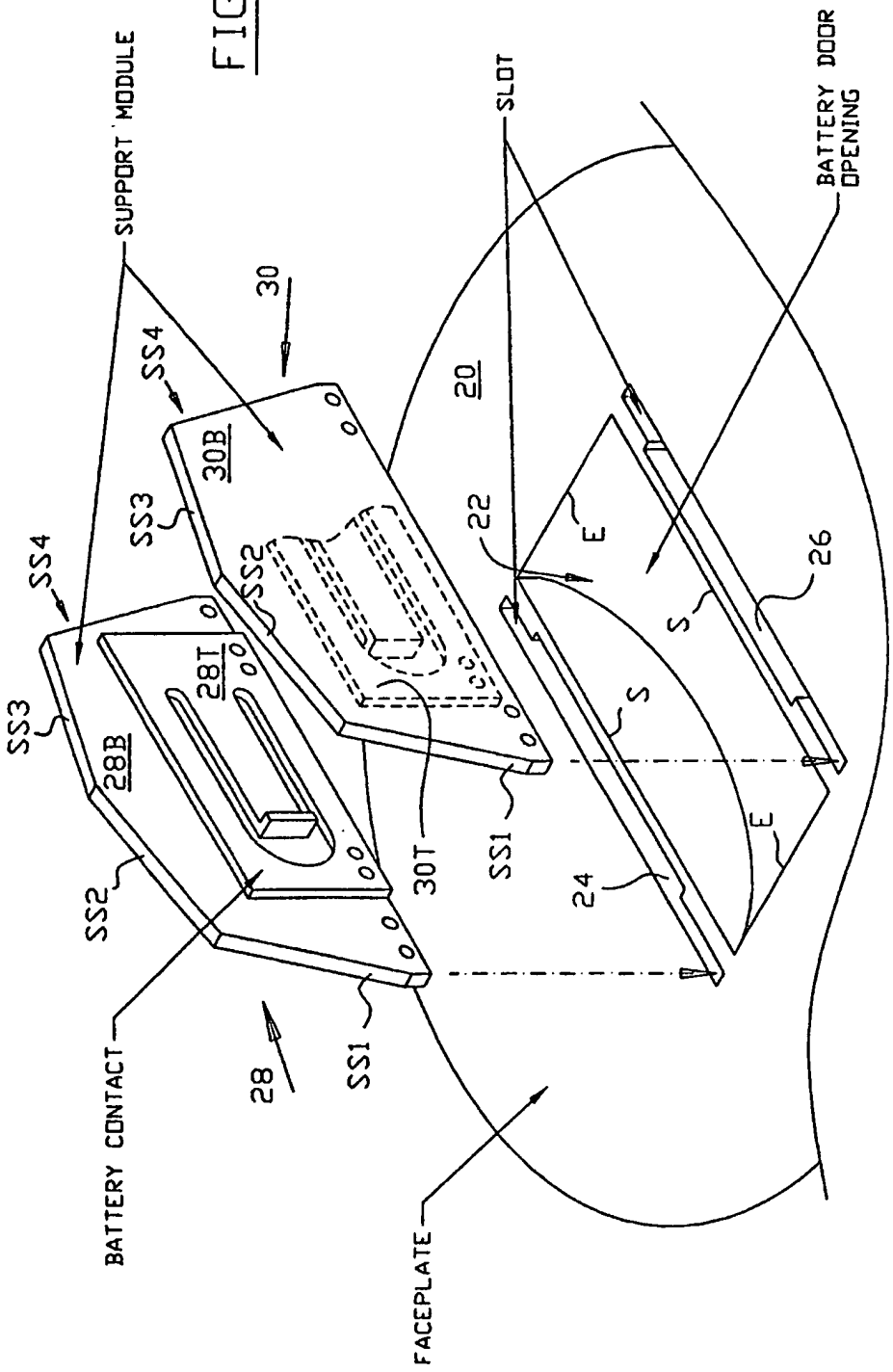


FIG 3.


SUPPORT MODULE
SS4
30
SS4
30B
SS3
SS2
SS4
SS3
28B
28T
SS2
BATTERY CONTACT
28
SS1
FACEPLATE
30T
SS1
20
SLOT
22
E
S
S
24
S
26
E
BATTERY DOOR OPENING

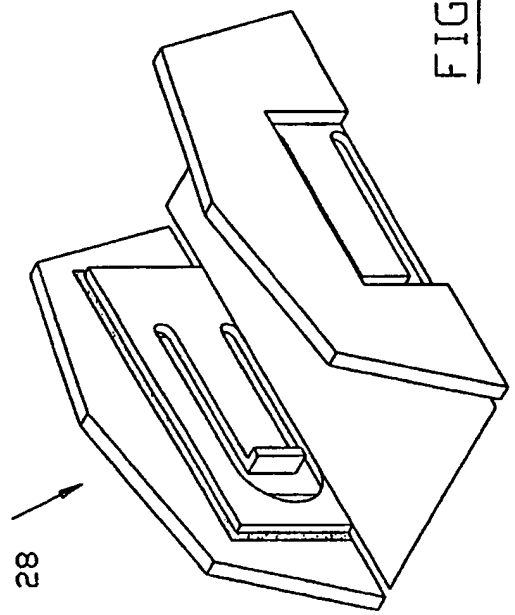


FIG 4B.

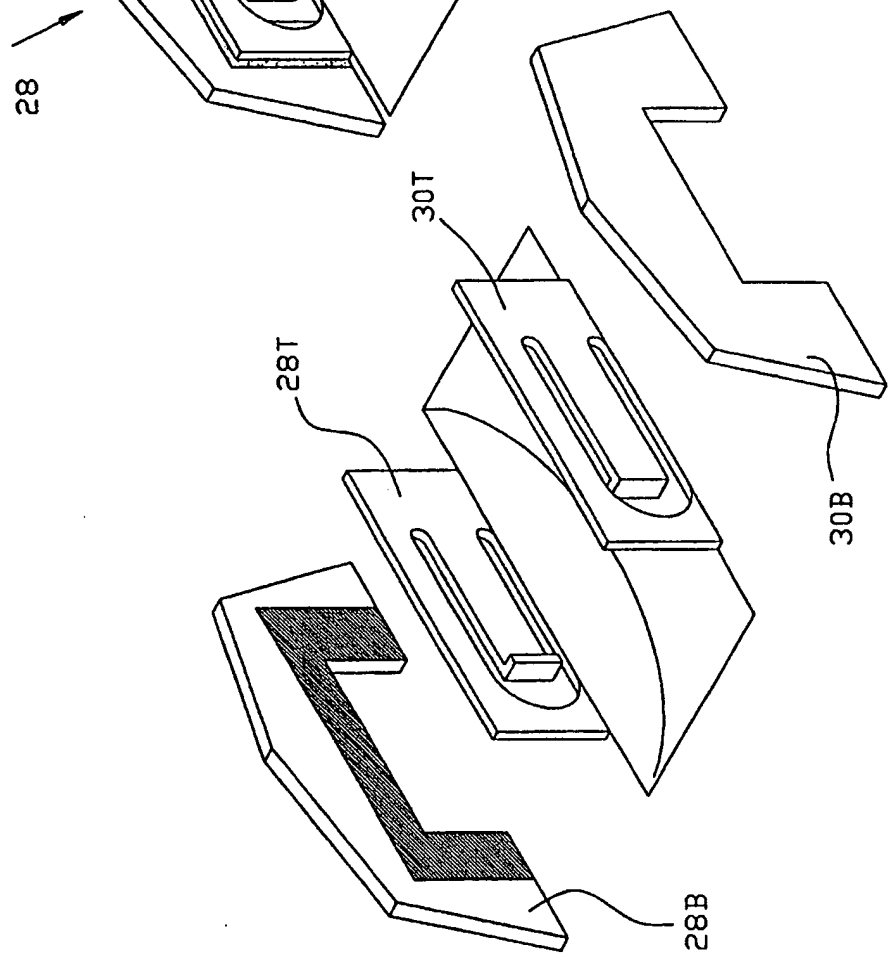


FIG 4A.

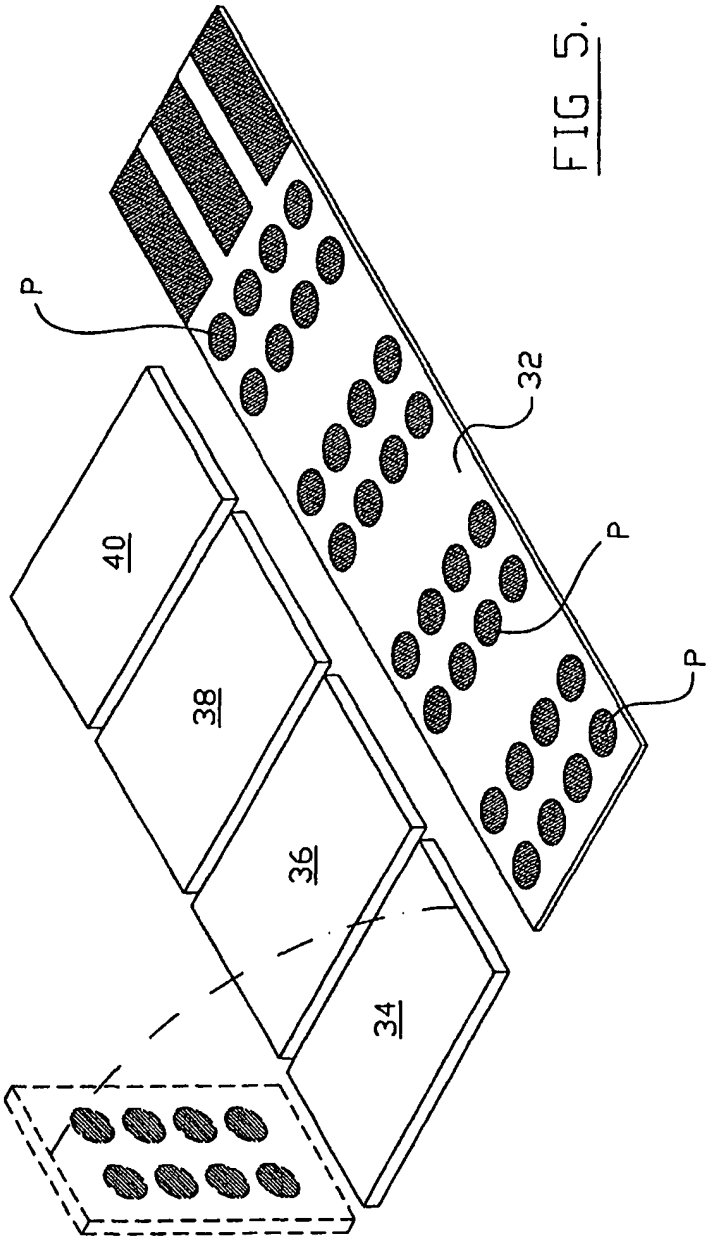


FIG 5.

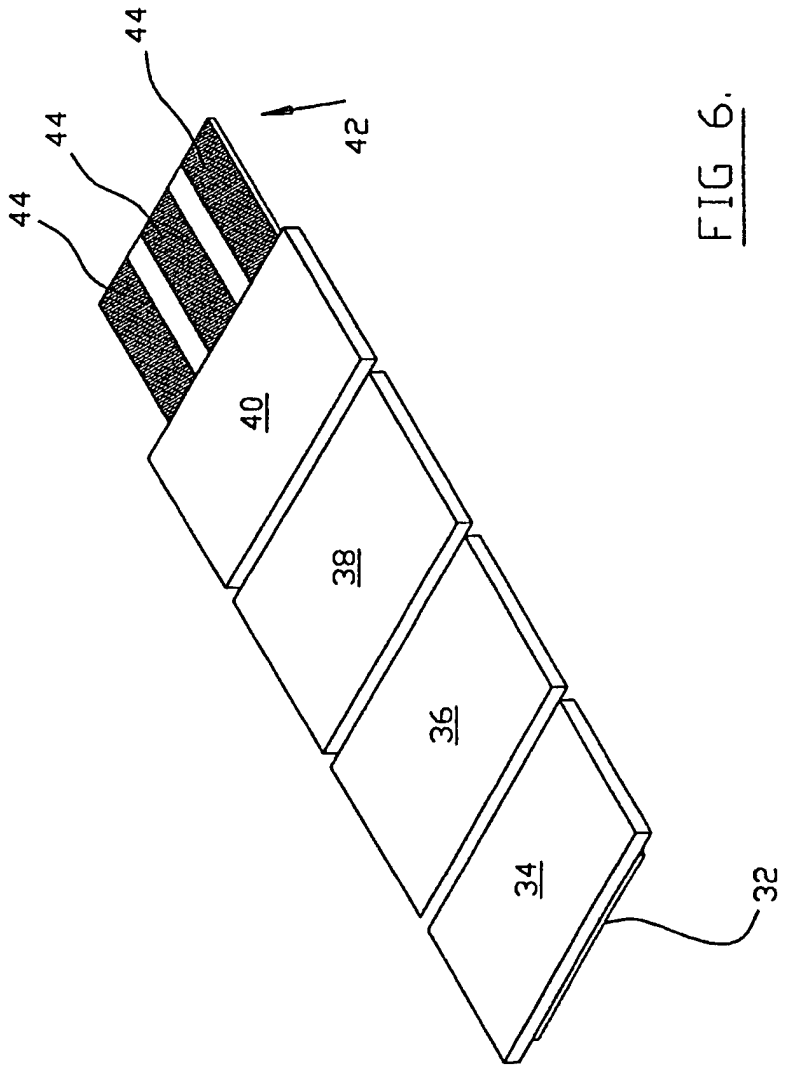


FIG 6.

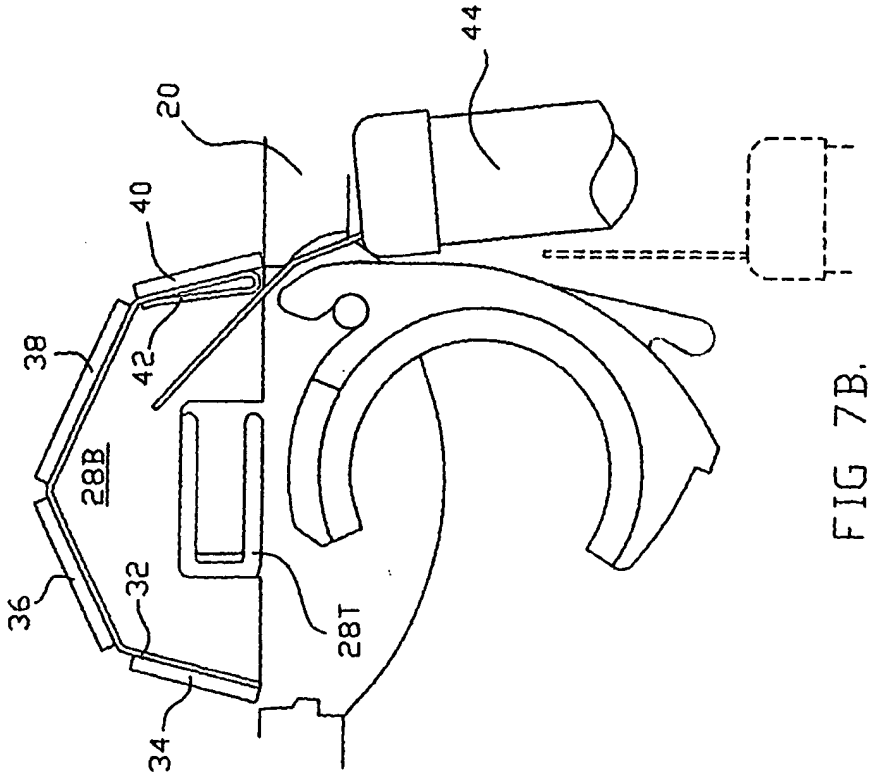


FIG 7B.

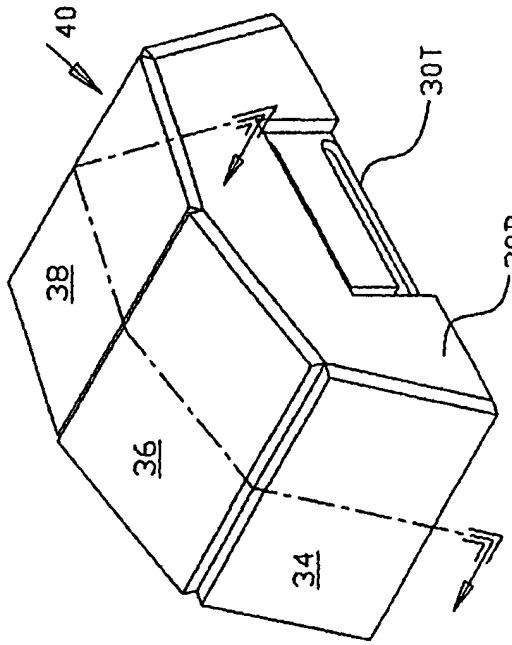


FIG 7A.

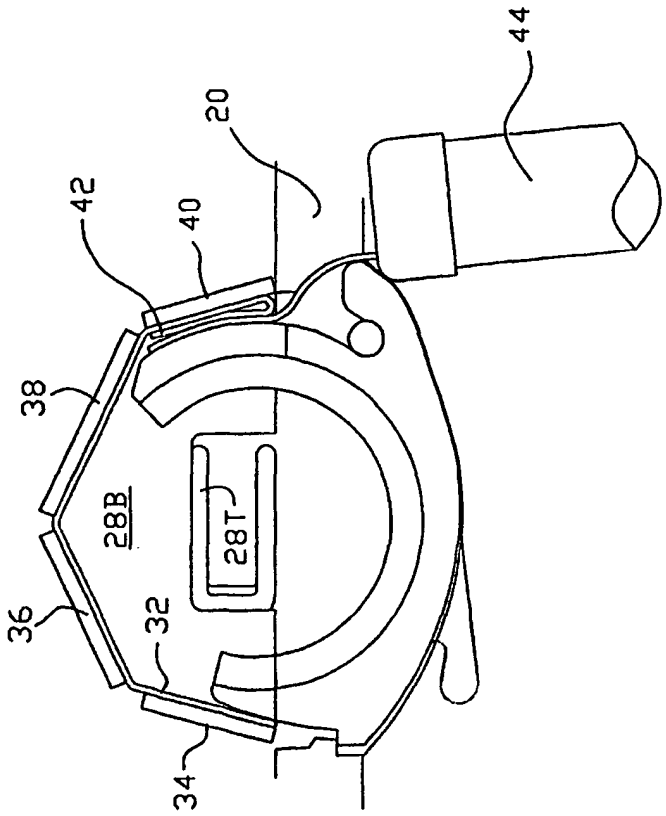


FIG 8.